EFFECT OF FLIP CLASSROOM AND PROJECT INSTRUCTIONAL DELIVERY METHODS ON STUDENTS' ACADEMIC PERFORMANCE IN FISHERY IN UNIVERSITIES IN SOUTH EAST NIGERIA

Ugorji, Njideka Chinwe & Associate Professor Ifeanyieze
Department of Agricultural Education, University of Nigeria, Nsukka.
njideka.ugorji@unn.edu.ng
08064235201

Abstract

This study examined the effectiveness of flip classroom and project method instructional delivery on students' academic performance in fishery in Universities in South East Nigeria. Quasi experimental design was adopted. Five objectives were formulated. Five research questions were formulated and five null hypotheses were tested at 0.05 level of significance. The population was made up of 919 students from five federal, five state and nine private universities in South East Nigeria. The sample for the study was 87 which comprised of 33 males and 54 females. The study focused on the five federal universities that offer fishery from the nineteen universities in the South East. Simple random sampling technique was used to select two universities out of the 5 federal universities in South East that was studied. These universities were the University of Nigeria, Nsukka (30) and Federal University of Technology, Owerri (57). Fishery cognitive performance test (FCPT); Fishery Psychomotor Performance Test (FPPT), and Fishery Interest Inventory (FII) were used for data collection. The instruments were validated by five experts from the University of Nigeria Nsukka and 87 copies were distributed through direct delivery technique with the help of three research assistants and 100 percent return rate was recorded. The reliability was obtained using Kuder Richardson formula 20(K-R 20) with internal consistency of 0.791 for FCPT, Pearson Product Moment Correlation Coefficient (PPMCC) was used to find the coefficient of stability of the FCPT at 0.766 and Cronbach Alpha method was used to determine the internal consistency of FPPT and FII which yielded 0.824 for FPPT and 0.716 for FII. The data obtained were analysed using mean, standard deviation and analysis of covariance (ANCOVA). The result favoured those taught with flip classroom method.

Keywords: Fishery, Academic performance, Flip classroom and Project instructional delivery method

Introduction

Fishery (pisciculture) is one of the growing agricultural enterprises in Nigeria because many people are interested in eating fish and its products. Fishery means stock of fish treated as a unit for the purposes of conservation and management, taking into account its geographical, scientific, technical, cultural, economic, recreational and other relevant characteristics (Ovie & Raji, 2016).Fishery as a branch of agriculture is one of the most ancient occupation of man practiced all over the world and has been recognized as a profitable business. (Food and Agricultural Organization FAO, 2012). Individuals that study fishery in higher institution on graduation are expected to earn their living via fish production or in the areas of boat, canoe, machinery, nets and line manufacturing or become experts in the areas of harvesting, processing or marketing of fish in addition to providing employment opportunities for other people thus enhancing the economy of the country through fisheries.

Fisheries make essential contributions to human well-being including provision of basic food, employment, recreational opportunities, foreign currency and others. The importance of fishery to the Nigeria economy is indicated by its contribution to the Gross Domestic Product (GDP) of 5.4% in 2002 (Federal Department of Fisheries, 2010). Fish contributes immensely to the enhancement of national health as it contains Omega III fatty acid that reduces the risk of cardiovascular diseases, hypertension and arteriosclerosis. Fish is thus medically prescribed as preferred animal protein especially to the age bracket of 50years or above. Omega III fatty acid is also responsible for proper development of brain cells in developing foetus thus making fish a welcome diet for pregnant mothers and young children as it is needed for good health and mental development. Fish enhances Intelligent Quotient (IQ) in developing children (Thompson, 2012). Due to the importance of fish and its products, the Nigerian government introduced fishery as one of the trade subjects/ courses in schools and tertiary institutions including universities; with the expectations that students who pass through the content could learn both theoretically and practically for self or paid employment. Practically, the students are

exposed to skills in breeding and rearing of fish. According to Olaitan in Nwabunwanne (2006), during practicals, individuals are taught activities that are relevant to occupations to increase the mastery of knowledge, skills and attitude and enable them develop innovative and creative abilities. The objectives of fishery as a course in universities are to; provide entrepreneurial skills needed for job creation, wealth generation, poverty eradication among others (Mahoney, 2014). In other to achieve these objectives, students are exposed to the curriculum contents and varieties of tools, equipment and teaching methods to enhance their academic performance.

Performance is the extent to which a student has achieved their short term or long-term educational goals. It is measured through examination or continuous assessment which is rated, scored and graded (Mahoney, 2014). To determine performance, a person can utilize performance test. Singer (2015) defined performance test as the type of mental assessment in which the subject is asked to carry out activities rather than to articulate something. In relation to educational research, Singer further stated that academic performance of a student can be regarded as the observable and measurable behaviour of the individual in a particular situation. Therefore, academic performance can be equated with the observable behaviours or scores obtained from teacher-made test. Academic performance of students could be poor or good.

Students' academic performance can be affected by a number of factors such as the teaching methods, techniques and instructional materials used among others. Therefore, educators are to engage in the use of teaching methods which will bring about increased performance among the students and enhance their learning abilities. Teaching methods such as flip classroom and project methods have been found to be efficacious in teaching, increasing students' performance and attitude towards practical subjects (Fuchs et al., 2002).

Flip classroom instructional delivery is a student-centred instructional model where students learn content online by watching video lectures, usually at home and homework is done in class with teachers and students discussing and solving questions (Felder, 2012). It is an instructional model in which the student's homework and in-class time is spent on collaborative, inquiry-based learning (Bergmann & Sams, 2012). Education providers globally are adopting online education with fully online taught courses that arguments face to face instruction. For this reason, institutions of learning have professional responsibility to expose students to flip classroom particularly in universities as these students have different needs and characteristics; further research is needed to inform practices of flipped classroom modes of education in universities.

However, several researchers indicated that some students were not satisfied with the flip classroom and preferred the project method (Lage et al., 2000; Crouch & Mazur, 2001; Albrecht, 2006; Zappe et al., 2009; Strayer, 2012).

Project-based learning is a teaching approach that engages students in sustained, collaborative real-world investigations, organizes learning around projects such as complex tasks based on challenging problems and involves students in design, problem solving and decision making (Buck Institute for Education, (BIE,2003). The use of flipped classroom and project method instructional delivery in teaching and learning fishery is a major way of curbing the challenges of students performing below standard due to reduced interest and low retention in universities in south east Nigeria.

It has been discovered that at secondary school level, students are not effectively taught, hence they perform low in external examinations with most not possessing the expected competency (Asogwa et al., 2021). Teachers of Agriculture in secondary schools were taught in universities theoretically and so impart the same theoretical knowledge and skills to their students. This is in line with Federal Ministry of Education (2013) that some problems of low performance of students in universities are due to poor method of teaching among others. Many teachers adopt participating teaching methods and in many developed countries, flipped classroom and project methods are found to be effective on teaching practical oriented courses, however, no study is certain on which of the two methods that can enhance student performance in Fishery. Therefore, this study sought to find out the effect of flipped classroom and project-based method of instructional delivery on academic performance of students in fishery in universities in South East Nigeria. The study specifically seeks to:

1. Compare the academic performance of students taught fishery using flip classroom and project methods.
2. Determine the effect of gender on the academic performance of students taught fishery using flip classroom and project methods.

3. Determine the interest of students taught fishery using flip classroom and project methods.
4. Determine the interaction effect of method and gender on students' interest.
5. Determine the retention capacity of students exposed to fishery using flip classroom and project methods.

Research Questions

1. What is the academic performance of students taught fishery using flip classroom and project methods?
2. What is the effect of gender on the academic performance of students taught fishery using flip classroom and project methods?
3. What is the interest of students taught fishery using flip classroom and project methods?
4. What is the interaction effect of method and gender on students' interest?
5. What is the retention capacity of students exposed to fishery using flip classroom and project methods?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance:

1. There is no significant difference in the mean performance of students taught fishery using flip classroom and project instructional delivery methods.
2. There is no significant difference between the performance of male and female students taught fishery using flip classroom and project instructional delivery methods.
3. There is no significant difference in the mean interest of students taught fishery adopting flip classroom and project instructional delivery methods.
4. There is no significant interaction effect of method and gender on students' interest when exposed to fishery using flip classroom and project instructional delivery methods.
5. There is no significance difference in the mean retention capacity of students exposed to fishery using flip classroom instructional delivery method and project method.

Methodology

The study adopted quasi experimental factorial design and was carried out in Universities in South East Nigeria. The study was specifically focused on the 3rd year students who are in fish and fish management education for the 2018/2019 academic session. The population for the study was 919 students (comprising of 441 males and 478 females) from five federal, five State and nine private universities in South East Nigeria. The sample for the study was 87 which comprises 33 males and 54 females all from the Federal University of Technology, Owerri (FUTO) and University of Nigeria Nsukka (UNN). Simple random sampling technique was used to select two universities out of the five federal universities in South East that was studied. These universities were University of Nigeria, Nsukka with 30 students which comprised 10 males and 20 females and Federal University of Technology, Owerri with 57 students which comprised 23 males and 34 females. The two universities selected, were randomly assigned to experimental groups which are Flip classroom and Project method respectively. There is no control group because it does not randomly assign participants, the control and experimental groups are often non-equivalent in number. In each school, one intact class (3rd year students) was drawn for the study.

Three sets of instruments were used to collect data for this study. The fishery cognitive performance test (FCPT), Fishery psychomotor performance test (FPPT) and Fishery Interest Inventory (FII). The FCPT and FPPT were developed by the researcher based on NUC curriculum course specifications. The instruments were validated by five experts from the University of Nigeria Nsukka while 919 copies of the validated instruments were administered through direct delivery technique with the help of three research assistants and 100 percent return rate was recorded. A scoring guide/marking scheme was also developed for the FCPT while a rating scale was developed for FPPT which was used by the examiners to score the cognitive Performance test and rate the students' performance of the practical tasks respectively. The fishery cognitive test had 50 items with each having 4 options (A, B, C,& D). The four options had one as the most correct answer while the remaining three were distracters. Each correct answer attracts a score of 1 mark with a total score of 50 marks. The fishery psychomotor test had 10 items which

was used to rate skills or students' ability to manipulate and handle the necessary materials, tools, and equipment used in the course (fishery) during the practical exercise. Each of the items of the FPPT was assigned four-point response options of Excellent, Good, Fair, Poor with values of 5, 4, 3, 2 respectively. The Fishery interest inventory (FII) was also developed by the researcher. The 20 items developed were to find out the interest of students in Fishery activities. Also, the items emphasized activities that are related to skilled tasks. Each of the items of the interest inventory was assigned four-point response options of Strongly Agreed, Agreed, Disagreed and Strongly Disagreed with values of 4, 3, 2 and 1 respectively.

The reliability was obtained using Kuder Richardson formula 20 (K-R 20) which was used to find the internal consistency of the items of the FCPT which was 0.791, Pearson Product Moment Correlation Coefficient (PPMCC) was used to find the coefficient of stability of the FCPT which gave 0.766 and Cronbach Alpha method was used to determine the internal consistency of FPPT and FII which yielded 0.824 for FPPT and 0.716 for FII.

The researcher visited the selected universities to inspect the students and facilities. The researcher obtained the permission of the respective Heads of Departments. Sampled universities were assigned to experimental group and control group. The cooperation of the students and staff were sought for, and informed on the objectives of the study. Pre-test was first administered to the two groups using FCPT, FPPT and FII before the treatment exercise to determine the equivalence of the subjects assigned to project -based learning group and Flip classroom – based learning group. Then treatment commenced in all the groups. Project- based learning group were taught Fishery with PBL lesson plans while the Flip classroom – Based learning group were taught fishery using the FBL lesson plan. The teaching period lasted for 3weeks. There-after, post-test was administered on the two groups and after an interval of about one week, a retention test was administered. The scores of the two groups on pre-test, post-test and retention test were computed and analysed using mean to answer the research questions while Analysis of Covariance (ANCOVA) to test the null hypotheses at 0.05 level of significance.

Results

Research Question 1: What is the performance of students taught fishery using flip classroom and those taught using project instructional delivery methods?

Table 1: **Mean and standard deviation of students taught fishery using flip classroom and those taught using project instructional delivery methods**

Method	Pre-test		Post test		Mean gain
	$\bar{x}$	SD	$\bar{x}$	SD	
Flip	37.95	13.054	68.65	12.933	30.7
Project	38.37	13.306	54.26	10.525	15.89

Data in Table 1 showed that Students taught fishery using Flip classroom had mean scores of 37.95 at pre-test, 68.65 at post and mean gain of 30.7. Standard deviation showed the variability of students' scores around their mean score while students taught fishery using project method had mean scores of 38.37 at pre-test, 54.26 at post-test and mean gain of 15.89. At post-test, students in flip classroom individual scores recorded high variability compared to their counterparts in project method. The mean gain of students taught using flip classroom is higher compared to mean gain of students taught using project method. In other words, students taught Fishery using Flip classroom method performed better compared to their counterpart taught with project method.

Hypotheses 1: There is no significant difference in the mean performance of students taught fishery using flip classroom and those taught using project instructional delivery method.

Table 2: Analysis of covariance test of no significant difference in the mean performance of students taught fishery using flip classroom and those taught using project instructional delivery methods.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	4657.446[a]	4	1164.362	8.400	.000
Intercept	26423.524	1	26423.524	190.634	.000
Pre-test	79.699	1	79.699	.575	.451
Gender	289.552	1	289.552	2.089	.152
Method	4229.213	1	4229.213	30.512	.000
Gender * Method	42.967	1	42.967	.310	.579
Error	10811.469	78	138.609		
Total	326267.000	83			
Corrected Total	15468.916	82			

Table 2 shows that there is a significant difference in the mean scores of students taught fishery with flip classroom and project method $df_= (1, 82)$, F= 30.512, P = .000. In other words, there is a significant difference in mean score of students taught with flip and project instructional method in favour of flip classroom instructional method as p-value is less than 0.05. The hypothesis of no significant difference was rejected while the alternative hypothesis was accepted.

Research Question 2: What is the effect of gender on the academic performance of students taught fishery using flip classroom and project methods?

Table 3: Mean scores and standard deviations of male and female students taught fishery using Flip classroom and project instructional delivery methods.

Gender	Flip		Project	
	$\bar{x}$	SD	$\bar{x}$	SD
Male	67.40	8.978	50.71	12.732
Female	69.40	11.377	56.19	13.254

Table 3 shows that in flip classroom, male had mean score of 67.40 with standard deviation of 8.978 while in project method; male had mean score of 50.71 with standard deviation of 12.732. Also, in a class where flip classroom instruction was used, female had mean score of 69.40 with standard deviation of 11.377 while female in class where project method was used had mean score of 56.19 with standard deviation of 13.254. The mean score based on gender showed that gap between male and female students was closer in flip classroom compared to scores of male and female which was wider in project method. Therefore, flip classroom method of instruction is gender friendly compared to project method. The standard deviation showed how close individuals' scores were to the group mean. The standard deviation of 8.978 for male and 11.377 for female showed that variability of individual scores were closer to their mean score in flip classroom compared than the project method with standard deviation of 12.732 for male and 13.254 for female which are higher.

Hypothesis 2: There is no significant difference between the performance of male and female students taught fishery using flip classroom and project instructional delivery methods.

Table 4: Analysis of covariance test of no significance difference in the mean Performance of students taught fishery using flip classroom and project instructional delivery methods based on gender.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3037.911[a]	4	759.478	8.884	.000
Intercept	1887.150	1	1887.150	22.075	.000
Interest-pre-test	293.224	1	293.224	3.430	.068
Gender	422.336	1	422.336	4.940	.029
Method	863.136	1	863.136	10.096	.056
Gender * method	761.425	1	761.425	8.907	.064
Error	6668.186	78	85.490		
Total	291010.000	83			
Corrected Total	9706.096	82			

Analysis of covariance conducted in Table 3 also showed that there no significant difference in mean score of students based on gender df (1, 82) = 10.096, P = .056. Hence, the instructional method of teaching is gender friendly as the p-values is greater than **0.05** level of significant. The null hypothesis of no significant difference in the mean Performance of students taught fishery using flip classroom and project instructional delivery methods based on gender was retained and alternative hypothesis was rejected.

Research Question 3: What is the Interest of students taught fishery using flip classroom and project instructional delivery methods?

Table 5: Mean and standard deviation of interest rating of students taught fishery using flip classroom and project instructional delivery methods.

Method	Interest pre-test		Interest post-test		Interest gain
	$\bar{x}$	SD	$\bar{x}$	SD	
Flip	46.23	6.257	62.77	13.764	16.54
Project	46.49	5.705	53.98	4.120	7.49

Data in Table 4 showed that in the class where flip classroom method of instruction was used, students' mean ratings were 46.23 at pre-test, 62.77 at post-test and interest gain of 16.54. With reference to the project method, students' mean scores were 46.49 at pre-test, 53.98 at post-test and interest gain of 7.49. Therefore, the result showed that flip method of instruction enhanced students' interest more when compared to their counterparts who were taught using project method of instruction. Standard deviation measured students' individual scores closeness to their group means.

Hypothesis 3: There is no significant difference in the mean interest of students taught fishery adopting flip classroom and project instructional delivery methods

.

Table 6: Analysis of covariance test of significant difference in the mean interest of students taught fishery adopting Flip classroom and those taught using project instructional delivery methods.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	3037.911[a]	4	759.478	8.884	.000
Intercept	1887.150	1	1887.150	22.075	.000
Interest-pre-test	293.224	1	293.224	3.430	.068
Gender	422.336	1	422.336	4.940	.029
Interest	**863.136**	**1**	**863.136**	**10.096**	**.002**
Gender * method	761.425	1	761.425	8.907	.064
Error	6668.186	78	85.490		
Total	291010.000	83			
Corrected Total	9706.096	82			

In Table 6, the result showed that there is significance difference in the mean interest rating of students taught fishery using flip classroom and those taught using project instructional delivery methods F (1, 82) = 10.096, p = .002. Therefore, there is a significant difference in the mean rating of students exposed to flip classroom and project method of instruction as the p-value is less than **0.05** level of significance in favour of students exposed to fishery using flip classroom. The null hypothesis of no significant difference was rejected while the alternative hypothesis was upheld.

Research Question 4: What is the interaction effect of method and gender on students' interest when exposed to fishery using flip classroom and project instructional delivery methods?

Table 7: Mean and standard deviation of interaction effect of method and gender on students' interest when exposed to fishery using flip classroom and project instructional delivery methods.

Method		Pre-test		Post-test		Mean
	Gender	$\bar{x}$	SD	$\bar{x}$	SD	Gain
Flip	Male	41.87	14.422	67.40	12.732	25.53
	Female	35.60	11.843	69.40	13.254	33.80
Project	Male	42.65	12.134	51.29	8.550	8.64
	Female	35.58	13.515	56.19	11.377	20.61

Data in Table 7 showed that males had mean score of 41.87 at pre-test, 67.40 at post-test with mean gain of 25.53 while the females scored 35.60 at pre-test and 69.40 at post-test with mean gain of 33.8. In the project method, males scored 42.65 at pre-test, 51.29 at post-test with mean gain of 8.64 while females had mean scores of 35.58 at pre-test, 56.19 at post-test with mean gain of 20.61. Hence, flip classroom method of instruction enhanced both male and female students' performance by 25.53 and 33.80 in favour of females. Similarly, project method enhanced both male and female students' performance by 8.64 and 20.61 in favour of females. In both methods, female students performed higher than the male counterparts. The gap between male and female performance in flip classroom was closer compared with project instructional delivery method which has wider gaps.

Hypothesis 4: There is no significant interaction effect of method and gender on students' interest when exposed to fishery using flip classroom and project instructional delivery methods. The result presented in Table 5 showed that there were no significant interaction effects of students exposed to fishery using flip classroom and project instructional delivery methods F (1, 82) = 8.907, p = .064. Therefore, the interaction effect between gender and instructional method is not significant as p-value is greater than 0.05. This means that the different in mean interest rating is not dependent on gender. The null hypothesis was accepted while the alternative hypothesis was rejected.

Research Question 5: What is the retention capacity of students taught fishery using flip classroom instructional delivery method and project methods?

Table 8: Mean and standard deviation of the retention capacity of students exposed to fishery using flip classroom instructional delivery method and project method

Method	Post test		Retention		Knowledge loss
	$\bar{x}$	SD	$\bar{x}$	SD	
Flip	68.65	12.933	62.42	11.374	6.23
Project	54.26	10.525	37.91	6.240	16.35

Data in Table 8 showed that after three weeks of the programme, students who were taught fishery using Flip classroom method had mean score of 68.65 at post-test and mean score of 62.42 at retention test while students who were taught using project method had mean score of 54.26 at post-test and mean score of 37.91 at retention test. The standard deviation showed how close students' individual score to the group mean. The knowledge retained showed difference between the post-test and retention test. Therefore, students exposed to flip classroom instruction retained knowledge higher compared to their counterpart in project method. Flip classroom instruction enhanced knowledge retention more than project method.

Hypothesis 5: There is no significant difference in the mean retention capacity of students taught with fishery using flip classroom instructional delivery method and project method.

Table 9: Analysis of covariance test of significant difference in the mean retention capacity of students exposed to fishery using flip classroom instructional delivery method and project method

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	14806.333[a]	4	3701.583	66.644	.000
Intercept	1487.243	1	1487.243	26.777	.000
Post-test	2203.288	1	2203.288	39.669	.000
Gender	325.947	1	325.947	5.868	.018
Retention	**4478.332**	**1**	**4478.332**	**80.629**	**.000**
Gender * method	40.923	1	40.923	.737	.393
Error	4332.293	78	55.542		
Total	224345.000	83			
Corrected Total	19138.627	82			

Table 9 result showed that there is a significance difference in the mean retention capacity of students exposed to fishery Flip classroom instructional delivery method and those exposed to project method in F (1, 82) = 80.629, P = .000. Therefore, there is a significant difference in the mean score of student taught Fishery using flip classroom and project method in favour of flip instructional method as p-value is less 0.05 level of significant. The null hypothesis was rejected and alternative hypothesis was upheld.

Discussion

Effects of flip classroom and project instructional methods on students' academic performance in Fishery

With respect to research question one, this study revealed that flip classroom method of teaching enhanced students' performance more than project method as the mean gain of students taught using flip classroom was higher compared to the mean gain of students taught fishery using project methods. A further test of analysis of covariance showed that there is a significant difference in mean score of students taught with flip and project instructional methods in favour of flip instructional method at 0.05 level of significant. This could be attributed to flip classroom activities that are more personalized and guided than project method (Erdem, 2014). Erdem stressed that flipped class room introduces students to a topic at home before they apply what they have learned in the classroom through online learning materials. The finding of this study is in conformity with the findings of Umar (2015) who stated that flip classroom instruction enhanced students' academic performance in social studies in junior

secondary school in Kogi state. Even though, flip classroom has been found effective, Bello (2003) who investigated the resource for teaching library revealed that flip charts are very rare in school. However, Yusuf (2016) revealed that project method of instruction is very effective in teaching social studies when compared to conventional method. In other words, project method is effective when compared to conventional method but when compared with flip instructional method especially in teaching fishery; flip instructional method becomes more effective.

Effects of flip classroom and project instructional methods on male and female students' academic performance in fishery

The findings on research question two revealed that flip method of instruction enhanced both male and female students' performance when compared to their counterparts in the project classroom. Analysis of covariance showed that there was no significant difference in male and female performance due to instructional methods at 0.05 level of significant. In agreement with the findings of this study, Yusuf (2016) revealed that when project method of instruction is applied in teaching and learning, gender is not a significant factor. The findings of the study were in consonance with the findings of Oviawe (2010) who noted that gender had no significant effects on students' performance when three differential instructional methods were used in implementing Building technology in polytechnics in Nigeria. In other words, project and flip methods of teaching do favour either male or female as both perform equally. Hence, gender factor is insignificant when these two methods are used in teaching. In contrary to the findings of this study, Umadi (2009) revealed that males performed better than their female counterparts in Radio, Television and Electronic Work (RTVE) in urban and rural technical colleges in Delta State. This could be attributed to the method of instruction the teacher adopted why implementing the contents of the lesson.

Effects of flip classroom and project instructional methods on students' interest in fishery

The students' interest due to instructional method as captured in research question 3, of this study revealed that flip method of instruction enhanced students' interest compared to their counterparts who were taught using project method of instruction. Analysis of variance showed that there is a significant difference in the mean rating of students exposed to flip classroom and project method of instruction at 0.05 level of significance favouring those exposed to fishery using flip classroom. These two methods of instruction enhanced students' interest to an extent, but this finding has shown that flip method of instruction enhanced students' interest more when compared to project method. According to Michael (2014), flip classroom involves blended learning through online engagement which may also combine face-to-face method with computer mediated activities to deliver instruction. Michael further stated that flip classroom activities enhanced reflective thinking and interaction among students. This statement is in line with Ogbu (2008) who revealed that interaction pattern enhances students' interest. Zappe, (2009) revealed that the flipped classroom allows for student learning to become personalized as it gives students opportunity to choose methods that best match their preferred learning style.

Interaction effect of flip classroom, project instructional method and gender on students' academic performance in fishery

With regards to interaction effects of method and gender in research question four, this study found that the gap between male and female students is closer in flip classroom compared to project method classroom. Analysis of covariance showed that the interaction effect between gender and instructional method is not significant at 0.05. This means that the differences in mean ratings of males and females are not important enough to be attributed to gender factor. Hence, gender is not a significant factor when project method and flip classroom method of instruction are considered in teaching fishery. In contrary to the findings of this study, Ferreira (2011) revealed that there is significant interaction effect among teacher competencies, student-student interactions and learning performance. It also revealed that through the structural model, perceived teacher competencies influence student-student interactions and learning performance positively and significantly; student-student interactions positively and significantly influence the learning performance which, in turn, influences positively and significantly students' academic performance. Also based on interaction effects, Asif (2011) and Mnguember (2012) affirmed that a classroom interaction between instructional methods that teachers adopt enhances student's academic performance.

Effects of flip classroom and project instructional methods on students' academic retention in fishery

On retention of knowledge due to method as capture in research question five, this study also revealed that students exposed to flip classroom instruction helped

students retain knowledge higher when compared to their counterpart in project method. Analysis of covariance showed that there is a significant difference in the mean score of student taught fishery using flip classroom and project method in favour of flip instructional method at 0.05 level of significant. In line with this finding, Owoso (2010) revealed that constructivist learning approached enhanced students' retention of knowledge. Flip instructional method helps students to reconstruct their thinking because it enables them to view the content of the learning before and after the classroom activities. Flip class instructional activities which can be done online and offline enhances students' cognition as Ozden and Gultekin (2008) revealed that cognition enhances students' retention of knowledge.

Conclusion

The importance of fishery which is one of the growing agricultural enterprises in Nigeria cannot be over-emphasized. To maximize essential contributions of fishery to human well-being including provision of basic food, employment, recreational opportunities, foreign exchange and others, the flip instructional methods should be used in teaching the curriculum contents at university. It has been shown by this study that flip classroom instructional method enhances students' performance, interest and retention in fishery more than project method of instruction in South East Nigeria. Based on this finding, Lecturers should understand that in other to inculcate the skills of fish farming, attention should be paid to the method of instructions adopted in implementing the contents of the curriculum. The method of teaching fishery goes a long way to determine the interest of students in fishery, their abilities to retain knowledge of what they have learnt for long term use in practice of fish farming and their performance in fishery profession.

Recommendations

Based on the findings of this study, the following recommendations were made

1. In other to increase students' performance, interest and retention of knowledge in leaning fishery, flip instructional method should be recommended to Agricultural teachers.
2. Workshops, seminars and conferences should be organized to exposed teachers to innovative pedagogies that incorporate information and communication technology like flip classroom instructional method and the appropriate content it can be applied.
3. As result of gender friendliness of flip and project method, Agricultural teachers should use it to teach students irrespective of gender. When this is done both male and female students will perform and retain higher.
4. Curriculum planner and textbook authors should include flip and project as methods for teaching and learning of Agriculture. It should have more emphasis in books among other teaching methods.

References

Abrantes, J. L., Seabra, C., & Costa, L. F. (2011). Pedagogical affect, student interest, and learning performance. *Journal of Business Research,* 17(6)159-167

Abubakar, D. (2013) Maintenance technology and productivity. J*ournal on productivity improvement.* National Productivity centre, 24(6) 8-16.

Aremu, A. O. & Sokan (2014). Impact of home, school and government on primary school pupils' academic performance. *Journal of the Exceptional Child 5(1):* 106 - 110.

Asif, M.E (2011). *The effect of classroom interaction on students' academic performance at secondary school level.* Retrieved Nov.2015 from http//etd.fcia.edu western edu.

Asikhia O. A. (2010). Students and teachers' perception of the causes of poor academic performance in Ogun State secondary schools: Implications for counselling for national development. *In European Journal of Social Sciences, 13(2),* 229 - 242.

Asogwa, V. C., Isiwu E. C., & Ugwuoke, C. U. (2021). Effect of instructional materials on students' academic performance in fishery in senior secondary schools. International Journal of Technical Vocational Education. 20, 153-161.

Bergmann, J., & Sams, A. (2012). *Flip your classroom: Reach every student in every class every day.* Alexandria, VA: Association for Supervision and Curriculum Development.

Buck Institute for Education (2003). *Project Based Learning Handbook: A Guide to Standards-*

Focused Project Based Learning for Middle and High School Teachers. Introduction chapter free to download at: http://www.bie.org/tools/handbook

Crouch, C. & Mazur, E. (2001). Peer instruction: Ten years of experience and results. American Association of Physics Teachers. doi: 10.1119/1.1374249

Deci, E.K. & Ryan, R.M. (1985). Intrinsic motivation and self-determination in human behavior. New York: Plenum Press.

Erdem A. (2014). The Flipped Classroom: A Course Redesign to Foster Learning and Engagement in a Health Professions School. Academic Medicine, Vol. 89, No. 2

FAO (2012) Fisheries. *Fishery country profile-Republic of Nigeria, general economic data1*, [November 2012]

FAO (2015) *Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication*. FAO. Rome, Italy. 18 pp. Also (also available online at www.fao.org/3/a-i4356e.pdf)

FAO (2007). Handbook on Small-scale Freshwater Fish Farming. Available at: http://www.fao.org/docrep/t0581e/t0581e00.htm

FDF (2010) Federal Department of Fisheries. Press Report of the Federal. 13-17

Federal ministry for education (2013) *National Policy on Education,* Lagos. NERDC

Felder, R.M. (2012). Engineering education–A tale of two paradigms. In SFGE, 2nd. Int. Conf on Geotechnical Engineering Education, Galway. Field, A.P. (2013). Discovering statistics using SPSS: And sex and drugs and rock 'n' roll (4th ed.). London: Sage.

Fuchs, D., Fuchs, L. S., Mathes, P.G., & Martinez, E.A. (2002). Preliminary evidence on the social standing of students with learning disabilities in pals and non-pals' classrooms learning. *Disabilities Research & Practice* 17(4), 205 - 215.

Lage, M., Platt, G., &Treglia, M. (2000). Inverting the classroom: A gateway to creating an inclusive learning environment. *Journal of Economics Education, 31*(1), 30-43.

Mahoney R.C(2014). "Effects of breakfast composition on cognitive process in elementary school children". Physiology and Behaviour. 85(5):635-645.

Mazur, E. (2009, January). Farewell, lecture? Science, 2, 50- 51.doi:10.1126/science.116892

Michael, B. Horn and Heater Staker (2014), Blended using Disruptive Innovation to Improve Schools (San-Francisco: Jossey-Brass),.30, 159–167.

Mnguember, R.A (2012). The effect of teacher-student class interaction on academic performance of senior secondary students in economics. Retrieved on 17th sept 2010 from http://south eastern edu.

Nwabunwanne, C.C. (2006). Practical Home Economics Teaching Apre-requisite to Entrepreneurship. Journal of Home Economics Research, 7 (special edition).

Ogbu, J. E. (2008). Effects of Interaction patterns on Students' performance and Interest in Basic Electricity. UnpublishedPh.D Thesis. Department of Vocational Teacher Education, University of Nigeria, Nsukka.

Olaitan, S. O, (2009) *Curriculum development and management in Vocational and Technical Education.* Onitsha: Cape Publishers international limited. Organization annual report. 35:56-66.

Oviawe, J.I. (2010). Differential effects of three instructional methods on students' performance in building technology in polytechniques in Nigeria. *University of Nigeria Abstracts of theses* 2005-2010, Vol. 2.

Ovie, S.I and Raji, A. 2016. Fisheries Co-Management in Nigeria: an analysis of the underling policy process in Food security and poverty alleviation through improved valuation and governance of river Fisheries in Africa National Institute for Freshwater Fisheries Research 30p.

Owodunni, A. S. (2010) Effects of reflective inquiry instructional technique on academic performance and interest of radio, television and electronic work students in technical colleges. An unpublished Ph. D thesis, university of Nigeria, Nsukka

Owoso, J. O. (2010). Effects of constructivist Instructional Approach on performance and Retention of Auto mechanics students in Technical Colleges in Lagos State. *University of Nigeria Abstracts of theses* 2005-2010, Vol. 2.

Ozden, M. & Gultekin, M. (2008). The effects of brain-based learning on academic performance and retention of knowledge in science course.

retrieved on 10th October, 2012 from *http://ejee.southwestern.edu*

Sams, A. (2013). Flip Your Students' Learning. Educational Leadership, 70(6), 16.

Sams, A., & Bergmann, J. (2012). *Flip your classroom: Reach every student in every class every day.* International Society for Technology in Education (ISTE).

Singer, J. (2015). *Opinion gap: Measuring Public School Academic Performance*.ACS - VT 2000.

Strayer, J. (2012). How learning in an inverted classroom influences cooperation, innovation and task orientation. Learning Environments Research, 15, 171–193.

Ukoha, U.A. & Eneogwe, U.N. (2012). The instructional process in B.A. Ogwo (Ed.) *curriculum development and educational technology.* Makurdi: Onaivi printing and publishing Co. Ltd.

Umadi, K.E. (2009). A Relational Study of Students' Academic performance of Television Technology in Technical Colleges in Delta State of Nigeria. *Journal of industrial Teacher Education* Vol.46, (3). Retrieved on 5th February, 2012 from http://scholarlib.vt.educ/ejournals/JITE/V46n3/umadi.html

Umar, H.A. (2015). The Effect of Challenge – Based Learning on Mathematic Self-Efficacy Belief, Interest and performance of Low-Achieving Mathematics Students in Kogi State, Nigeria. *Journal of Science and Technology*.Vol.1, (4).

Yusuf, A.T (2016). The effect of project method on the performance of students in social studies in junior secondary school. Retrieved on 8 March 2018 from http/www.crews.org/curri/western edu.

Zappe, S., Leicht, R., Messner, J., Litzinger, T., & Lee, H. (2009). "Flipping" the classroom to explore active learning in a large undergraduate course. Proceedings of the 2009 American Society for Engineering Education Annual Conference and Exhibition